

## Millimeter-Wave Radio (MMW)

### MMW Radio – 60 & 70GHz, Gigabit Ethernet Overview



#### About CableFree

Founded in 1997 and with headquarters in London, UK, CableFree is a leading designer and supplier of broadband wireless communication equipment.

With a complete range of solutions including Radio, Microwave, Millimeter-Wave, Free Space Optics, WiFi and WiMax solutions, customers in over 60 countries have chosen CableFree as the “one stop shop” solution of choice for dependable wireless networking.

#### About Millimeter-Wave

CableFree Solutions is offering a range of high performance radios using Millimeter-wave frequencies. Using high frequency microwave signals above 50GHz, large bandwidths of up to Full Duplex Gigabit Ethernet capacity can be provided.

Millimeter wave is a technology complimentary to CableFree’s established range of FSO (Free Space Optical) communication systems. Planning for Millimeter wave is based on rainfall, compared to FSO which is based on visibility, predominantly fog.

## System Features

- Capacity 1.25Gbps Full Duplex
- Operates in semi-licensed 60/70GHz bands
- Range up to 5km\*
- “Pencil beams” of 0.6 - 1.2degrees
- Rugged outdoor grade waterproof enclosure

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## Applications

- Point-to-Point Wireless networking
  - Corporate backbone or Telecom service provider
  - Resilience for FSO or Fibre links
- Fast Roll-out & Temporary Deployment

## Gigabit Ethernet 57-64/55-66/71-76 GHz

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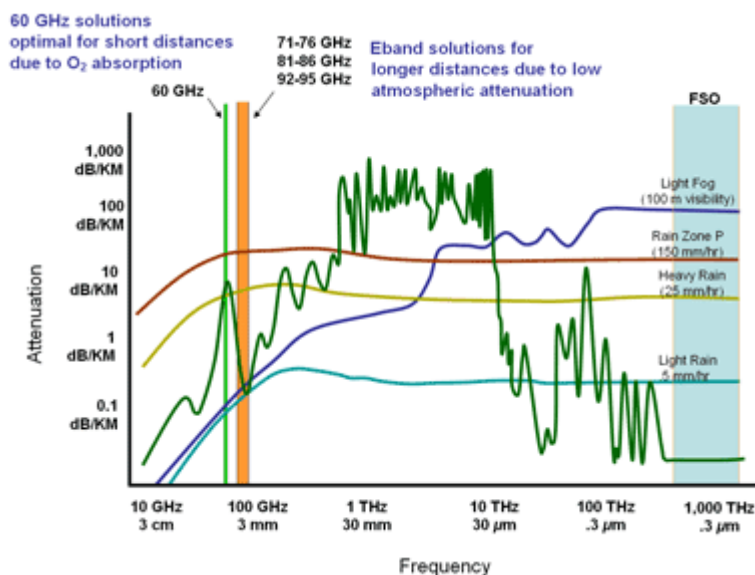
CableFree’s MMW-60-GE and MMW-70-GE are full-duplex Gigabit point-to-point links especially designed according to FCC and ETSI requirements. They provides interconnection between remote LAN segments at ultra high speed and utilizes Gigabit Ethernet protocols, which is the evolving standard for switches and routers available from a variety of telecommunication equipment manufacturers.

One full-duplex Gigabit Ethernet link provides 1.25 gigabit-per-second connectivity that is the equivalent of approximately 650 T1 lines or 1,000 DSL connections. The MMW-70-GE product has 1000 Base-SX connections at each end of the wireless link and transparently establishes the link outputs. The resulting connection can replace a fibre-optics cable physically connected end-to-end. The wireless mm-wave Gigabit link provides fibre equivalent performance, reliability and security but with no high deployment cost associated with outdoor fibre installations.

The Gigabit Ethernet point-to-point millimeter wave radio links have been designed with compact parabolic Cassegrain antennas of 30 and 60 cm diameters. The 60 cm antenna has a 0.4° beam width and 50 dB antenna gain parameters, which are fully compliant with FCC specification requirements for E-band communication. Note, the FCC recently allowed the use of smaller, less expensive antennas with a minimum antenna gain of 43 dBi and a 1.2 degree half-power beamwidth available on the MMW-70-GE systems as well. MMW-70-GE equipment has been offered as a comprehensive link kit with antennas, mounting units and accessories to allow a turnkey installation into the customer’s communication system.

The MMW-70-GE operating distances vary from 1 to 4.5 miles or 1.5 to 7 km for varying weather conditions depending of the link frequency and rain intensity. Planning for millimeter wave spectrum use must take into account the propagation characteristics of radio signals at this frequency range. While signals at lower frequency bands can propagate for many miles and penetrate more easily through buildings, millimeter wave signals can travel only a few miles or less. However, these characteristics of millimeter wave propagation are not necessarily disadvantageous. Millimeter waves can permit more densely packed communications links, thus providing very efficient spectrum utilization, and they can increase security of communication transmissions.

## Operating distance limit for mm-wave



## communication

The spectrum between 30 GHz and 300 GHz is referred to as the millimeter wave band because the wavelengths for these frequencies are about one to ten millimeters. Millimeter wave propagation has its own peculiarities. This bulletin reviews the characteristics of millimeter wave propagation, including free space propagation and the effects of various physical factors on propagation. It was created to provide an easy to understand reference explaining the characteristics of radio signal propagation at millimeter wave frequencies and their implications for spectrum management.

The millimeter wave spectrum at 30-300 GHz is of increasing interest to service providers and systems designers because of the wide bandwidths available for carrying communications at this frequency range. Such wide bandwidths are valuable in supporting applications such as high speed data transmission and video distribution. Planning for millimeter wave spectrum use must take into account the propagation characteristics of radio signals at this frequency range. While signals at lower frequency bands can propagate for many miles and penetrate more easily through buildings, millimeter wave signals can travel only a few miles or less.

However, these characteristics of millimeter wave propagation are not necessarily disadvantageous. Millimeter waves can permit more densely packed communications links, thus providing very efficient spectrum utilization, and they can increase security of communication transmissions.

The following graph show the major advantage of the "E-band" over the 60GHz in terms of the Oxygen absorption peak. E-band links offer longer distances and higher availability than 60GHz links for this reason.

## Specifications

System Variant	MMW-70-GE	MMW-60-GE
<b>System Parameters</b>		
Frequency Band	E band	60GHz band
Bandwidth	71-76 GHz	57-64 (FCC) or 59-66 (TELEC) GHz
Capacity	1250 Mbps Full duplex	1250 Mbps Full duplex
Modulation Type	ASK	ASK
Rx Sensitivity	-87 dBW	-87 dBW
Output Power	50 mW	10 mW
Network Management	RS485 interface; Smartagent SNMP Option	RS485 interface; Smartagent SNMP Option
Remote Parameters Monitoring	Proprietary adapter in ODU with software application [Windows 98/2000/XP]	Proprietary adapter in ODU with software application [Windows 98/2000/XP]
<b>Data and Aux Interface</b>		
Ethernet Interface	1000Base-LC (for multimode fiber, Standard IEEE 802.3z/D.50-1998)	1000Base-LC (for multimode fiber, Standard IEEE 802.3z/D.50-1998)
Diagnostics Port	RS-485 [with optional RS-232]	RS-485 [with optional RS-232]
<b>Antenna</b>		
Antenna Type	Cassegrain type antenna with radome	Cassegrain type antenna with radome
Antenna Gain/beamwidth	30cm: 41dBi, 0.9° beamwidth 60cm: 48dBi, 0.5° beamwidth	30cm: 42dBi, 1.2° beamwidth 60cm: 47dBi, 0.5° beamwidth
<b>Power / Environment</b>		
Power Supply AC	Input 88-264 Volts, 50/60 Hz	Input 88-264 Volts, 50/60 Hz
Transceiver Power Consumption	20 W maximum	20 W maximum
DC Power	36 to 72 Volts DC, external AC supply option	36 to 72 Volts DC, external AC supply option

Power Connector Ethernet Power Connector	Internal connector /	Internal connector
Operational Temperature	-30°C to +70°C	-30°C to +70°C
Humidity	0 to 95%, non-condensing	0 to 95%, non-condensing
<b>Physical Dimensions</b>		
Outdoor size antenna	unit 330 x 350 x 460 mm w/o	330 x 350 x 460 mm
Weight (ODU w/o antenna)	30cm: 7 kg max	30cm: 7 kg max

Product Code	Description
CFMMW-70-GE-xx	CableFree E-band MMW Gigabit Ethernet radio including IP65-rated outdoor unit, management software, Power supplies with mains 115/230Vac input. Does not include Ethernet cables.
CFMMW-60-GE-xx	CableFree 60GHz MMW Gigabit Ethernet radio including IP65-rated outdoor unit, management software, Power supplies with mains 115/230Vac input. Does not include Ethernet cables.
Options: -30 or -60	Antenna sizes 30 or 60cm
CFMMW-Manager	CableFree MMW Management software, PC based, uses serial port connection
CFSA-MMW	CableFree SmartAgent platform MMW edition, IP network management appliance, includes IP LAN/WAN network interfaces, HTTP/web management interface, SNMP traps and onboard graphical logging software

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